

A QUANTITATIVE STUDY OF THE VEGETATION SURROUNDING
A *XANTHORHIZA SIMPLICISSIMA* (RANUNCULACEAE) POPULATION
AT FORT POLK IN WEST CENTRAL LOUISIANA

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ABSTRACT

Yellow root (*Xanthorhiza simplicissima* Marsh.) is a rare species (S1) in Louisiana known only from Vernon Parish. Quantitative data from 60 belt transects are reported and the plant community associated with yellow root is described. Yellow root in Louisiana is found along the edge of a baygall stream and is associated with the tree species *Magnolia virginiana*, *Nyssa biflora*, and *Liquidambar styraciflua*; the shrub species *Lyonia lucida*, *Ilex coriacea*, and *Vaccinium elliotii*; and the herbaceous species *Chasmanthium laxum*, *Mitchella repens*, and *Dichantheium commutatum*. Yellow root is absent downstream in a more mesic area created by a larger natural levee associated with a larger stream.

RESUMEN

Xanthorhiza simplicissima Marsh. es una especie rara (S1) en Luisiana conocida solo de de Vernon Parish. Se aportan los datos cuantitativos de 60 transectos y se describe la comunidad de plantas asociadas con ella. *X. simplicissima* se encuentra en Luisiana a lo largo del borde de un torrente pantanoso y está asociada con tres especies arbóreas *Magnolia virginiana*, *Nyssa biflora*, y *Liquidambar styraciflua*; las especies arbustivas *Lyonia lucida*, *Ilex coriacea*, y *Vaccinium elliotii*; y las especies herbáceas *Chasmanthium laxum*, *Mitchella repens*, y *Dichantheium commutatum*. *X. simplicissima* está ausente aguas abajo en un área más mésica creada por un dique natural asociado a un cauce más grande.

INTRODUCTION

Yellow root (*Xanthorhiza simplicissima* Marsh.) is a small deciduous shrub in the Ranunculaceae family. It is found throughout the eastern portion of the United States, ranging from Texas to Maine, with the exception of Vermont and New Hampshire (USDA NRCS 2012). Yellow root has been found in two of the three states that border Louisiana: Texas and Mississippi. The current county records for yellow root in East Texas include San Jacinto, Newton, and Jasper. In Mississippi, yellow root is widely distributed and has been found in Tishomingo and Itawamba counties in the northeast, Lafayette County in the north central, and Lauderdale, Jones, and Forrest counties in the southeast (USDA NRCS 2012). This species is demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery, and has a global ranking of 5 (NatureServe 2012). It is considered imperiled in Texas (S2) and critically imperiled in Florida and Louisiana (S1).

Yellow root was first reported in Louisiana in 1987 (Allen et al. 1987) from Vernon Parish, the only location in the state. In Vernon Parish, yellow root is located on US Forest Service/Fort Polk land in two locations that are ca 6000m apart. The larger population is found on an unnamed creek that drains generally from east to west and empties into the Ouiska Chitto Creek, just north of Lookout Road. At this location, the downstream distribution of yellow root apparently ends about 100m from where the tributary empties into the larger Ouiska Chitto Creek. With the flooding that can occur along this small stream, yellow root is probably distributed downstream very readily. In theory, it should be found farther downstream and even along the banks of the Ouiska Chitto Creek. Several searches downstream from this population on the banks of the tributary and continuing along the Ouiska Chitto Creek have not yielded any populations of yellow root. The second and much smaller population is south of Lookout Road on an unnamed creek that drains from east to west and empties into Drake's Creek.

The habitat reports for this species include shaded stream banks, moist woods, thickets, and rocky ledges (Parfitt 1997). The Louisiana Natural Heritage Program reports that small stream forests are the preferred

habitat for this species (Louisiana Natural Heritage Program 2011). In the Carolinas, the plant has been reported on shaded stream banks (Radford et al. 1968). Godfrey and Wooten (1981) described its habitat as river and stream banks, moist thickets, and springy places, usually shaded. The objectives of this study were to document the species that are associated with yellow root, describe the plant community where yellow root grows, and compare and contrast the plant community and species association downstream in habitats where yellow root has not been found.

Each Louisiana population is located in a baygall; the larger population within one of the baygalls studied by Allen et al. (2004). The soil along the stream bank where yellow root grows is mainly the Guyton-Iuka complex, frequently flooded (Soil Survey Division 2003).

METHODS

The larger population of yellow root was used for sampling. The distance (482 meters) along the creek from the farthest upstream to the farthest downstream location was measured and recorded. A 482 meter long macroplot was created to include the known range of yellow root along the tributary. Using a random number generator, fifty plot centers out of the 482 points were selected for sampling. Beginning from the last downstream yellow root location, a fifty meter macroplot was created downstream from that point and ten sampling locations were randomly selected out of the fifty potential points. All sixty (50 upstream and 10 downstream) sampling points were sampled using a 20 m x 1m belt transect. Each transect was centered over the stream and oriented perpendicular to the stream. The plant categories sampled included herbaceous plants, woody vines, shrubs and saplings (woody non-vine species shorter than 6 ft = 1.83 m), and trees and shrubs (woody non-vine species taller than 6 ft = 1.83m). During the sampling period, the number of stems in a sample for each species were counted and recorded. For herbaceous plants, woody vines, and shrubs and saplings, cover was determined by measuring the area occupied by the plant(s). The cover percent was calculated by multiplying the area times the density and then dividing by the area of the sample (200,000 cm²). The cover was converted to a percent by multiplying by 100. For the trees and shrubs taller than 1.83m, the dbh was measured at the standard 1.37m height using a diameter tape and recorded to the nearest 0.1 cm. The woody plant data in the sixty samples were recorded in the fall only while the herbaceous plant data were recorded in the fall and again in the spring. To facilitate relocation of plots, a metal pin was left in the center of the stream until the re-sampling was completed.

All data were entered into a Microsoft Excel spread sheet for storage and calculation of variables. The mean diversity (richness-species per sample) and mean density (stems per sample) were calculated for the samples in each group (upstream or downstream) for all plant categories while the mean dbh was calculated for trees and shrubs and mean cover percent was calculated for herbaceous plants, woody vines, and shrubs and saplings. The frequency and mean density were calculated for each species in a sample group. The mean dbh was calculated for tree and shrub species and the mean cover percent for all other species in a sample group. The relative values for each of these variables (frequency, mean density, mean dbh, and mean cover percent) were calculated by dividing the value for a species by the total for all species within the sample group and plant category. Each value was converted to a percent by multiplying by 100 and the sum of these relative values was used to calculate the importance value.

RESULTS

The number of species in the upstream area with yellow root totaled 122 and contained 24 trees and shrubs, 50 shrubs and saplings, 13 woody vines, and 57 herbaceous plants (Table 1). The number of species in the downstream area without yellow root totaled 69 with 15 trees and shrubs, 34 shrubs and saplings, 9 woody vines, and 25 herbaceous plants. In the upstream area, the mean number of species per sample ranged from 3.44 for trees and shrubs to 14.92 for shrubs and saplings while in the downstream study area the mean number of species per sample ranged from 4.10 for trees and shrubs to 14.40 for shrubs and saplings. In the upstream area where yellow root was present, the mean density ranged from 7.12 stems for trees and shrubs to 92.10 for

TABLE 1. Species diversity (richness) of samples in the upstream area with yellow root and downstream without yellow root at Fort Polk, Louisiana.

	Yellow root Present (Upstream, 50 samples)				
	All Plants	Trees & Shrubs	Shrubs & Saplings	Woody Vines	Herbaceous Plants
Mean	33.34	3.44	14.92	5.26	12.32
Std Dev.	5.93	1.62	2.97	1.66	3.62
Total Number	122	24	50	13	57

	Yellow root Absent (Downstream, 10 samples)				
	All Plants	Trees & Shrubs	Shrubs & Saplings	Woody Vines	Herbaceous Plants
Mean	31.10	4.10	14.40	6.10	9.80
Std Dev.	3.84	0.99	1.96	0.88	2.39
Total Number	69	15	34	9	25

TABLE 2. Community physiognomy variables (density, cover percent, and DBH) of samples in the yellow root area and just downstream at Fort Polk, Louisiana.

	Yellow root Present (Upstream) Density (stems per sample), 50 samples				
	All Plants	Trees & Shrubs	Shrubs & Saplings	Woody Vines	Herbaceous Plants
Mean	207.06	7.12	92.10	19.48	88.36
Std Dev.	65.36	5.15	26.50	11.13	51.91

	Yellow root Absent (Downstream) Density (stems per sample), 10 samples				
	All Plants	Trees & Shrubs	Shrubs & Saplings	Woody Vines	Herbaceous Plants
Mean	149.60	9.80	55.90	33.70	50.20
Std Dev.	30.29	8.11	15.46	10.90	14.16

	Yellow root Present (Upstream) 50 samples Cover Percent & DBH (cm)				
	All Plants	Shrubs & Saplings	Woody Vines	Herbaceous Plants	Trees & Shrubs
Mean	7.13	4.48	0.50	2.15	36.35
Std Dev.	2.04	1.89	0.65	1.14	29.40

	Yellow root Absent (Downstream) 10 samples Cover Percent & DBH (cm)				
	All Plants	Shrubs & Saplings	Woody Vines	Herbaceous Plants	Trees & Shrubs
Mean	6.15	2.85	1.90	1.40	34.02
Std Dev.	2.34	1.06	1.29	0.61	22.01

shrubs and saplings. The downstream area, without yellow root, had a mean density range from 9.80 stems for trees and shrubs to 55.90 stems for shrubs and saplings (Table 2). In the upstream area, the mean cover percent ranged from 0.50% for woody vines to 4.48% for shrubs and saplings and in the downstream area the mean cover percent ranged from 1.40% for herbaceous plants to 2.85% for shrubs and saplings. In the upstream area, the mean density for all plants was 207.06 stems and the mean cover percent was 7.13% compared to a mean density of 149.60 stems and mean cover percent of 6.15% in the downstream area. The mean dbh was 36.35 cm for the trees and shrubs in the 50 samples upstream and 34.02 cm for the 10 samples downstream.

The frequency, mean density, mean cover percent, and importance value for the herbaceous plants in the area of yellow root are in Table 3 and the data for the same group of species in the area just downstream from yellow root are in Table 4. The similar data for the woody vines in the area of yellow root are in Table 5 and for the shrub and sapling species in Table 7. The similar data for the woody vines in the area just downstream from yellow root are in Table 6 and for the shrub and sapling species in Table 8. The frequency, mean density, mean dbh, and importance value for the trees and shrubs in the upstream area are in Table 9 and the data for this

TABLE 3. Frequency, mean density, mean cover percent, and importance value for herbaceous plants in 50 samples with yellow root (upstream) at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Chasmanthium laxum</i>	98.00	11.60	0.40	39.53
<i>Mitchella repens</i>	96.00	11.12	0.41	39.28
<i>Dichanthelium commutatum</i>	96.00	12.98	0.23	33.13
<i>Viola primulifolia</i>	86.00	16.44	0.01	26.16
<i>Dichanthelium dichotomum</i>	88.00	7.82	0.13	22.19
<i>Osmunda cinnamomea</i>	64.00	2.40	0.27	20.65
<i>Scleria oligantha</i>	82.00	3.28	0.20	19.71
<i>Osmunda regalis</i>	46.00	1.94	0.13	12.11
<i>Athyrium felix-femina</i>	60.00	2.38	0.05	9.69
<i>Carex</i> spp.	58.00	1.54	0.03	8.06
<i>Solidago patula</i>	44.00	2.66	0.01	7.08
<i>Aster lateriflorus</i>	38.00	1.12	0.03	5.97
<i>Apteria aphylla</i> *	32.00	2.48	0.00	5.41
<i>Panicum verrucosum</i>	30.00	2.34	0.00	5.25
<i>Rhynchospora charlocephala</i>	24.00	0.80	0.04	4.78
<i>Solidago caesia</i> *	28.00	1.46	0.01	4.42
<i>Carex glaucescens</i>	20.00	0.32	0.03	3.26
<i>Panicum rigidulum</i> *	12.00	0.38	0.04	3.23
<i>Dichanthelium sphaerocarpon</i>	20.00	0.42	0.02	3.14
<i>Dichanthelium aciculare</i> *	20.00	0.82	0.01	3.09
<i>Xyris ambigua</i> *	30.00	0.42	0.00	3.05
<i>Solidago rugosa</i>	14.00	0.42	0.00	1.79
<i>Woodwardia virginica</i> *	4.00	0.32	0.02	1.64
<i>Eupatorium fistulosum</i> *	12.00	0.20	0.00	1.41
<i>Elephantopus nudatus</i>	12.00	0.20	0.00	1.37
<i>Eupatorium rotundifolium</i>	12.00	0.22	0.00	1.29
<i>Pteridium aquilinum</i> *	10.00	0.18	0.00	1.13
<i>Xyris difformis</i> var. <i>curtisii</i>	10.00	0.18	0.00	1.03
<i>Arnoglossum ovatum</i> *	6.00	0.28	0.00	0.92
<i>Rhynchospora inexpansa</i> *	4.00	0.12	0.01	0.76
<i>Woodwardia aereolata</i>	4.00	0.28	0.00	0.76
<i>Schizachyrium scoparium</i> *	6.00	0.10	0.00	0.74
<i>Scutellaria integrifolia</i> *	6.00	0.10	0.00	0.64
<i>Aristida purpurascens</i> var. <i>virgata</i> *	4.00	0.04	0.01	0.62
<i>Chasmanthium latifolium</i>	2.00	0.12	0.01	0.60
<i>Lycopus rubellus</i> *	4.00	0.20	0.00	0.57
<i>Melanthium virginicum</i> *	4.00	0.06	0.00	0.51
<i>Liatris pycnostachya</i> *	4.00	0.06	0.00	0.43
<i>Centella erecta</i>	4.00	0.08	0.00	0.42
<i>Hypoxis hirsuta</i> *	4.00	0.04	0.00	0.39
<i>Dichanthelium tenue</i> *	2.00	0.06	0.00	0.33
<i>Carex intumescens</i> *	2.00	0.02	0.00	0.28
<i>Helianthus angustifolius</i> *	2.00	0.02	0.00	0.24
<i>Platanthera ciliaris</i> *	2.00	0.02	0.00	0.23
<i>Dichanthelium laxiflorum</i> *	2.00	0.04	0.00	0.22
<i>Rhexia virginica</i> *	2.00	0.04	0.00	0.22
<i>Axonopus fissifolius</i> *	2.00	0.02	0.00	0.22
<i>Oxypolis rigidior</i> *	2.00	0.02	0.00	0.21
<i>Oldenlandia bosci</i> *	2.00	0.04	0.00	0.21
<i>Eupatorium perfoliatum</i> *	2.00	0.02	0.00	0.21
<i>Eupatorium capillifolium</i> *	2.00	0.02	0.00	0.21
<i>Hyptis alata</i> *	2.00	0.02	0.00	0.21
<i>Panicum brachyanthum</i> *	2.00	0.02	0.00	0.20
<i>Coreopsis tripteris</i> *	2.00	0.02	0.00	0.20
<i>Lobelia puberula</i>	2.00	0.02	0.00	0.19
<i>Ludwigia mariana</i> *	2.00	0.02	0.00	0.19
<i>Conyza canadensis</i> *	2.00	0.02	0.00	0.19
Total	1232.00	88.36	2.15	300.00

* Only in the upstream samples with yellow root.

TABLE 4. Frequency, mean density, mean cover percent, and importance value for herbaceous plants in 10 samples in the area just downstream from yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Chasmanthium laxum</i>	100.00	19.10	0.63	93.14
<i>Mitchella repens</i>	100.00	6.40	0.32	45.54
<i>Scleria oligantha</i>	90.00	2.50	0.18	27.24
<i>Dichanthelium commutatum</i>	100.00	5.00	0.06	24.32
<i>Dichanthelium dichotomum</i>	90.00	2.90	0.04	17.66
<i>Viola primulifolia</i>	60.00	5.50	0.01	17.45
<i>Athyrium felix-femina</i>	80.00	2.50	0.01	13.87
<i>Carex</i> spp.	70.00	1.80	0.02	12.44
<i>Osmunda cinnamomea</i>	20.00	0.50	0.07	7.81
<i>Panicum verrucosum</i>	50.00	0.80	0.01	7.09
<i>Aster lateriflorus</i>	30.00	0.80	0.01	5.01
<i>Woodwardia areolata</i>	30.00	0.30	0.01	4.02
<i>Osmunda regalis</i>	20.00	0.30	0.02	4.00
<i>Botrychium biternatum</i> *	20.00	0.20	0.00	2.46
<i>Eupatorium rotundifolium</i>	20.00	0.20	0.00	2.45
<i>Solidago rugosa</i>	10.00	0.30	0.01	2.15
<i>Lobelia puberula</i>	10.00	0.20	0.01	2.07
<i>Carex glaucescens</i>	10.00	0.10	0.01	1.97
<i>Dichanthelium sphaerocarpon</i>	10.00	0.20	0.00	1.46
<i>Rhynchospora charlocephala</i>	10.00	0.10	0.00	1.44
<i>Solidago patula</i>	10.00	0.10	0.00	1.36
<i>Elephantopus nudatus</i>	10.00	0.10	0.00	1.30
<i>Dichanthelium bosci</i> *	10.00	0.10	0.00	1.27
<i>Centella erecta</i>	10.00	0.10	0.00	1.24
<i>Xyris difformis</i> var. <i>curtisii</i>	10.00	0.10	0.00	1.23
Total	980.00	50.20	1.40	300.00

* Only in downstream samples without yellow root.

TABLE 5. Frequency, mean density, mean cover percent, and importance value for woody vines in 50 samples in the area of yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Vitis rotundifolia</i>	46.00	1.18	0.17	48.39
<i>Smilax glauca</i>	74.00	4.20	0.06	47.82
<i>Gelsemium sempervirens</i>	70.00	2.68	0.07	40.71
<i>Smilax rotundifolia</i>	68.00	2.88	0.07	40.70
<i>Smilax pumila</i>	40.00	2.72	0.05	31.92
<i>Bignonia capreolata</i>	60.00	2.40	0.02	28.24
<i>Smilax laurifolia</i>	48.00	0.96	0.03	19.33
<i>Smilax smallii</i>	48.00	0.88	0.02	18.07
<i>Toxicodendron radicans</i> *	34.00	0.84	0.00	11.77
<i>Rubus argutus</i>	20.00	0.44	0.00	6.69
<i>Smilax bona-nox</i> *	12.00	0.24	0.01	4.80
<i>Parthenocissus quinquefolia</i> *	4.00	0.04	0.00	1.03
<i>Berchemia scandens</i> *	2.00	0.02	0.00	0.51
Total	526.00	19.48	0.50	300.00

* Only in the upstream samples with yellow root.

TABLE 6. Frequency, mean density, mean cover percent, and importance value for woody vines in 10 samples in the area just downstream from yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Vitis rotundifolia</i>	90.00	9.50	0.95	93.28
<i>Smilax glauca</i>	100.00	8.90	0.23	55.06
<i>Smilax rotundifolia</i>	90.00	3.50	0.31	41.48
<i>Smilax pumila</i>	70.00	3.70	0.31	38.55
<i>Bignonia capreolata</i>	90.00	4.40	0.02	28.82
<i>Smilax smallii</i>	70.00	1.40	0.02	16.52
<i>Gelsemium sempervirens</i>	50.00	0.80	0.04	12.80
<i>Smilax laurifolia</i>	40.00	0.90	0.01	9.51
<i>Rubus argutus</i>	10.00	0.60	0.01	3.97
Total	610.00	33.70	1.90	300.00

group of species in the downstream area are in Table 10. The species are arranged in descending importance value in all eight tables.

The two herbaceous species with the highest importance value in both areas were *Chasmanthium laxum* (L.) Yates and *Mitchella repens* L. but the importance value for *Chasmanthium laxum* (L.) Yates was much higher in the downstream area (93.14) than in the upstream area (39.53) (Tables 3 and 4). The third species in the area of yellow root was *Dichanthelium commutatum* (Schult.) Gould and in the area just downstream was *Scleria oligantha* Michx. The top two species in importance value among the woody vines in both areas were *Vitis rotundifolia* Michx. and *Smilax glauca* Walter but the importance value for *Vitis rotundifolia* in the upstream area was much higher (93.28) compared to a value of 48.39 in the downstream area (Tables 5 and 6). The third species in importance value in the area of yellow root was *Gelsemium sempervirens* (L.) W.T. Aiton and in the area just downstream from yellow root was *Smilax rotundifolia* L. In the upstream area, the shrub and sapling species with the highest important value was *Lyonia lucida* (Lam.) K. Koch and was followed by *Ilex coriacea* (Pursh) Chapm. and *Vaccinium elliotii* Chapm. (Table 7). In the downstream area, the shrub and sapling species with the highest importance value was *Vaccinium elliotii* Chapm. and was followed by *Halesia diptera* Ellis *Hypericum hypericoides* (L.) Crantz, and *Symplocos tinctoria* (L.) L'Her. (Table 8). The tree and shrub species with the highest importance value in the area of yellow root was *Ilex coriacea* (Pursh) Chapm., followed by *Magnolia virginiana* L., *Nyssa biflora* Walter, and *Vaccinium elliotii* Chapm. (Table 9). The tree and shrub species with the highest importance value in the area downstream from yellow root was *Vaccinium elliotii* Chapm., followed by *Acer rubrum* L. and *Nyssa biflora* Walter (Table 10).

Thirty-three herbaceous species were found only upstream in the area containing yellow root (Table 3). Two herbaceous species were found only downstream in the area without yellow root (Table 4). All other herbaceous species were found in both upstream and downstream samples (Tables 3 and 4). Four woody vine species were found only upstream with yellow root (Table 5). No vine species were unique to the downstream samples. All other woody vine species were found in both upstream and downstream samples (Tables 5 and 6). Twenty-two shrub and sapling species were found only upstream with yellow root (Table 7) and six shrub and sapling species were found only downstream without yellow root (Table 8). All other shrub and sapling species were found in both upstream and downstream samples (Tables 7 and 8). Twelve tree and shrub species were found only upstream with yellow root (Table 9) and three trees and shrub species were found only downstream (Table 10). All other tree and shrub species were found in both upstream and downstream samples (Tables 9 and 10).

DISCUSSION

The yellow root habitat in Louisiana is best described as the bank and natural levee of a baygall stream with the vegetation being typical of such a stream. We found the tree canopy vegetation associated with yellow root to

TABLE 7. Frequency, mean density, mean cover percent, and importance value for shrubs and saplings in 50 samples in yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Lyonia lucida</i>	98.00	25.48	2.11	81.42
<i>Ilex coriacea</i> *	88.00	7.92	0.75	31.27
<i>Vaccinium elliotii</i>	98.00	6.74	0.50	25.12
<i>Rhododendron canescens</i>	98.00	8.66	0.14	19.18
<i>Acer rubrum</i>	98.00	7.72	0.04	15.83
<i>Hypericum hypericoides</i> *	90.00	5.98	0.12	15.10
<i>Halesia diptera</i>	66.00	2.04	0.20	11.04
<i>Persea palustris</i>	76.00	2.58	0.11	10.34
<i>Quercus hemisphaerica</i>	70.00	4.14	0.03	9.78
<i>Pinus taeda</i>	72.00	2.54	0.02	8.06
<i>Quercus alba</i>	66.00	2.42	0.02	7.41
<i>Xanthorhiza simplicissima</i> *	38.00	3.62	0.03	7.07
<i>Ilex vomitoria</i>	46.00	0.98	0.06	5.45
<i>Hamamelis virginiana</i>	36.00	1.48	0.06	5.29
<i>Magnolia virginiana</i> *	42.00	0.88	0.04	4.69
<i>Symplocos tinctoria</i>	20.00	1.10	0.09	4.54
<i>Ilex opaca</i>	28.00	0.64	0.02	3.03
<i>Morella cerifera</i>	22.00	0.86	0.02	2.91
<i>Morella heterophylla</i> *	24.00	0.56	0.02	2.62
<i>Nyssa biflora</i>	26.00	0.54	0.00	2.41
<i>Liquidambar styraciflua</i>	24.00	0.38	0.00	2.12
<i>Quercus laurifolia</i>	24.00	0.36	0.00	2.05
<i>Viburnum nudum</i> *	20.00	0.38	0.00	1.85
<i>Itea virginica</i>	18.00	0.48	0.00	1.84
<i>Alnus serrulata</i> *	18.00	0.30	0.01	1.75
<i>Callicarpa americana</i> *	18.00	0.20	0.00	1.53
<i>Vaccinium virgatum</i>	8.00	0.48	0.02	1.52
<i>Cyrilla racemiflora</i> *	12.00	0.38	0.01	1.47
<i>Euonymus americanus</i>	14.00	0.24	0.00	1.22
<i>Quercus nigra</i> *	14.00	0.22	0.00	1.20
<i>Photinia pyrifolia</i> *	12.00	0.30	0.00	1.16
<i>Quercus falcata</i>	12.00	0.12	0.01	1.14
<i>Sassafras albidum</i>	14.00	0.14	0.00	1.11
<i>Chionanthus virginicus</i>	10.00	0.16	0.00	0.95
<i>Cornus florida</i> *	12.00	0.12	0.00	0.94
<i>Vaccinium arboreum</i>	10.00	0.14	0.01	0.94
<i>Styrax grandifolius</i> *	8.00	0.26	0.00	0.89
<i>Hypericum crux-andreae</i> *	8.00	0.18	0.01	0.85
<i>Viburnum dentatum</i>	8.00	0.08	0.00	0.65
<i>Prunus serotina</i>	6.00	0.10	0.00	0.53
<i>Castanea pumila</i> *	2.00	0.02	0.00	0.22
<i>Arundinaria gigantea</i>	2.00	0.02	0.00	0.19
<i>Fagus grandifolia</i> *	2.00	0.02	0.00	0.18
<i>Vaccinium fuscatum</i> *	2.00	0.02	0.00	0.18
<i>Toxicodendron vernix</i> *	2.00	0.02	0.00	0.18
<i>Pinus palustris</i> *	2.00	0.02	0.00	0.17
<i>Cephalanthus occidentalis</i> *	2.00	0.02	0.00	0.16
<i>Quercus stellata</i> *	2.00	0.02	0.00	0.16
<i>Sapium sebiferum</i> *	2.00	0.02	0.00	0.16
<i>Prunus mexicana</i>	2.00	0.02	0.00	0.16
Total	1492.00	92.10	4.48	300.00

* Only in upstream samples with yellow root.

be *Magnolia virginiana* L., *Nyssa biflora* Walter, and *Liquidambar styraciflua* L. The canopy with the shrub layer being *Lyonia lucida* (Lam.) K. Koch, *Ilex coriacea* (Pursh) Chapm., and *Vaccinium elliotii* Chapm. These species are very similar to the woody species reported for baygalls in the area by Allen et al. in 2004, in east Texas by

TABLE 8. Frequency, mean density, mean cover percent, and importance value for shrubs and saplings in 10 samples just downstream from yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Vaccinium elliotii</i>	100.00	12.80	1.29	75.05
<i>Halesia diptera</i>	100.00	3.80	0.23	21.90
<i>Hypericum hypericoides</i> *	100.00	5.30	0.14	21.32
<i>Symplocos tinctoria</i>	60.00	4.30	0.26	20.98
<i>Arundinaria gigantea</i>	60.00	3.30	0.19	16.68
<i>Rhododendron canescens</i>	100.00	3.60	0.09	16.51
<i>Acer rubrum</i>	90.00	3.60	0.05	14.44
<i>Quercus hemisphaerica</i>	100.00	3.40	0.02	13.90
<i>Hamamelis virginiana</i>	50.00	3.20	0.08	12.11
<i>Lyonia lucida</i>	30.00	1.90	0.15	10.82
<i>Ilex vomitoria</i>	60.00	1.40	0.09	9.77
<i>Nyssa biflora</i>	70.00	1.00	0.00	6.75
<i>Vaccinium virgatum</i>	40.00	1.10	0.06	6.69
<i>Ilex opaca</i>	50.00	0.90	0.04	6.58
<i>Quercus falcata</i>	60.00	0.90	0.01	6.13
<i>Itea virginica</i>	30.00	0.80	0.06	5.47
<i>Pinus taeda</i>	50.00	0.60	0.01	4.85
<i>Prunus serotina</i>	30.00	0.50	0.01	3.17
<i>Viburnum dentatum</i>	20.00	0.70	0.01	3.13
<i>Persea palustris</i>	30.00	0.40	0.01	3.12
<i>Liquidambar styraciflua</i>	30.00	0.40	0.00	2.95
<i>Quercus alba</i>	30.00	0.30	0.01	2.83
<i>Amelanchier arborea</i> *	30.00	0.30	0.00	2.64
<i>Magnolia virginiana</i> *	20.00	0.30	0.00	2.08
<i>Crataegus marshallii</i>	10.00	0.10	0.03	1.82
<i>Sassafras albidum</i>	10.00	0.20	0.00	1.20
<i>Vaccinium arboreum</i>	10.00	0.10	0.00	0.91
<i>Carya texana</i> *	10.00	0.10	0.00	0.90
<i>Quercus laurifolia</i>	10.00	0.10	0.00	0.90
<i>Prunus mexicana</i>	10.00	0.10	0.00	0.89
<i>Chionanthus virginicus</i>	10.00	0.10	0.00	0.89
<i>Ulmus alata</i> *	10.00	0.10	0.00	0.88
<i>Morella cerifera</i>	10.00	0.10	0.00	0.88
<i>Euonymus americanus</i>	10.00	0.10	0.00	0.88
Total	1440.00	55.90	2.85	300.00

* Only in downstream samples without yellow root.

Diggs et al. 2006 and in central Louisiana by MacRoberts et al. 2004. The herbaceous flora associated with yellow root in our area is dominated by *Chasmanthium laxum* (L.) Yates, *Mitchella repens* L., and *Dichanthelium commutatum* (Schult.) Gould; three species that have been noted by the senior author to be shade tolerant. Our data seem to verify the qualitative reports of the shaded stream bank, small stream bank, and moist woods habitat for yellow root. Yellow root was found in 19 of the 50 samples and had an importance value of 7.07 out of 300 and was the 12th ranked shrub in importance value.

In the downstream samples, the vegetation contains species that are usually associated with less wet or more mesic to dry sites. Red maple (*Acer rubrum* L.) and southern red oak (*Quercus falcata* Michx.) are two tree species with high importance values in the downstream samples and are usually found on more mesic sites. An herbaceous species (*Scleria oligantha* Michx.) is usually associated with mesic sites as are the shrub species *Halesia diptera* Ellis, *Hypericum hypericoides* (L.) Crantz, and *Symplocos tinctoria* (L.) L'Her. The dominance of these species downstream and the absence of yellow root seem to indicate that yellow root cannot tolerate the more mesic downstream sites. The big community difference in the downstream samples was the decrease in herbaceous plants (richness, density, and cover percent). The mean density and cover percent also decreased

TABLE 9. Frequency, mean density, mean cover percent, and importance value for trees and shrubs in 50 samples in the area of yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Ilex coriacea</i>	56.00	2.30	3.70	58.75
<i>Magnolia virginiana</i> *	32.00	0.62	3.67	28.11
<i>Nyssa biflora</i>	26.00	0.36	4.19	24.15
<i>Vaccinium elliotii</i>	34.00	0.72	1.26	23.47
<i>Liquidambar styraciflua</i>	22.00	0.22	3.62	19.45
<i>Halesia diptera</i>	26.00	0.42	1.74	18.24
<i>Quercus alba</i> *	16.00	0.18	3.84	17.74
<i>Persea palustris</i> *	24.00	0.30	1.93	16.51
<i>Acer rubrum</i>	20.00	0.28	1.83	14.78
<i>Pinus taeda</i> *	8.00	0.10	3.92	14.51
<i>Hamamelis virginiana</i> *	14.00	0.44	1.01	13.04
<i>Lyonia lucida</i>	20.00	0.38	0.40	12.26
<i>Ilex vomitoria</i>	6.00	0.20	0.75	6.61
<i>Cornus florida</i> *	4.00	0.08	0.93	4.84
<i>Rhododendron canescens</i>	6.00	0.14	0.21	4.29
<i>Quercus hemisphaerica</i> *	4.00	0.04	0.81	3.95
<i>Ilex opaca</i>	4.00	0.10	0.44	3.77
<i>Fagus grandifolia</i> *	6.00	0.06	0.27	3.32
<i>Quercus nigra</i> *	2.00	0.02	0.81	3.09
<i>Alnus serrulata</i> *	6.00	0.06	0.07	2.77
<i>Quercus falcata</i>	2.00	0.02	0.50	2.24
<i>Magnolia grandiflora</i> *	2.00	0.04	0.38	2.19
<i>Crataegus marshallii</i> *	2.00	0.02	0.04	0.97
<i>Symplocos tinctoria</i> *	2.00	0.02	0.03	0.94
Total	344.00	7.12	36.35	300.00

* Only in upstream samples with yellow root.

TABLE 10. Frequency, mean density, mean cover percent, and importance value for trees and shrubs in 10 samples just downstream from yellow root at Fort Polk, Louisiana.

Species	Frequency	Mean Density	Mean cover%	Importance Value
<i>Vaccinium elliotii</i>	80.00	4.10	5.72	77.70
<i>Acer rubrum</i>	80.00	1.10	7.70	52.91
<i>Nyssa biflora</i>	40.00	0.60	9.13	42.48
<i>Quercus falcata</i>	20.00	0.10	4.08	17.78
<i>Rhododendron canescens</i>	30.00	0.60	1.33	17.17
<i>Ilex vomitoria</i>	30.00	0.60	1.02	16.26
<i>Lyonia lucida</i>	10.00	0.70	0.76	11.76
<i>Halesia diptera</i>	30.00	0.30	0.52	11.73
<i>Ilex coriacea</i>	10.00	0.70	0.70	11.58
<i>Ilex opaca</i>	20.00	0.20	0.65	8.71
<i>Arundinaria gigantea</i> *	20.00	0.30	0.14	8.23
<i>Crataegus marshallii</i>	20.00	0.20	0.28	7.63
<i>Liquidambar styraciflua</i>	10.00	0.10	1.27	7.13
<i>Vaccinium arboreum</i> *	10.00	0.10	0.47	4.78
<i>Amelanchier arborea</i> *	10.00	0.10	0.25	4.14
Total	420.00	9.80	34.02	300.00

* Only in downstream samples without yellow root.

downstream for shrubs and saplings while increasing for woody vines. The lack of yellow root and these changes in the community seem to indicate a more mesic site created by a larger stream that produces a higher and thus more mesic natural levee.

Our data are the first quantitative report on the vegetation surrounding *Xanthorhiza simplicissima* Marsh. The vegetation around the other populations of *Xanthorhiza simplicissima* Marsh. throughout its range should be sampled for comparison with our data so as to get a better idea of the variation, if any, of its habitat.

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